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(19) 

(54) BONDING OF MATERIALS USING ADHESIVES

(71) We, LO SOUND DEVELOPMENTS LIMITED, a British Company, of Hawfield Works, Stanton, Burton-on-Trent, Staffordshire, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The invention relates to a method of bonding materials together using adhesives.

Presently available sound deadening materials are either composed of or incorporate a heat-fusible material or are applied using a heat or pressure sensitive adhesive. Those composed of or incorporating heat-fusible material or which utilise heat sensitive adhesives require the application of high temperatures not less than 275°F if a satisfactory bond is to be achieved, and those relying solely on pressure sensitive adhesive have low resistance to temperature and to paint finishes when in place and can only be successfully applied to completely clean surfaces, a condition which is difficult to obtain in practice.

We have now found that a satisfactory bond can be achieved by temporarily attaching the materials to one another, that is attaching them using an amount of pressure sensitive adhesive which is insufficient by itself to bond the materials securely, after which heating of the assembly to a temperature below that required for conventional heat sensitive adhesives, produces a bond of the necessary strength. This temperature is referred to herein and in the appended claims as the activation temperature.

In this way the energy required to effect bonding is considerably reduced resulting in economies in production costs. Effective bonding can be achieved at temperatures of about 170°F or less and the bond is maintained under all normal service conditions.

By virtue of the invention the materials can be temporarily attached by pressing them together and may then be firmly bonded during a subsequent heating stage.

Suitable pressure sensitive adhesives include aqueous acrylic polymer dispersions. One preferred adhesive comprises 60 to 70 per cent poly alkyl acrylate, 15 to 20 per cent of an alkyl acrylate/vinyl acetate copolymer and 15 to 20 per cent poly vinyl isobutyl ether, all percentages being by weight and has an activation temperature between 170° and 180°F.

The following are examples of adhesive compositions suitable for bonding sound deadening material to metal surfaces, the percentages quoted being by weight.

Example 1

Poly alkyl acrylate (as an aqueous dispersion 45-50% solids content) (sold under the Trade Mark ACRONOL 4D by B.A.S.F. Limited)	66.6%
Alkyl acrylate/vinyl acetate copolymer (as an aqueous dispersion of 50-55% solids content) (sold under the trade Mark VINACRYL 4501X by Vinyl Products Limited)	16.8%
Poly vinyl isobutyl ether (as an aqueous dispersion of 53-57% solids content)	16.6%

The poly alkyl acrylate used is usually poly butyl acrylate and is a homopolymer, but other polymers may be suitable, for example poly octyl acrylate. Some alkyl acrylate copolymers are equally suitable and in general terms those alkyl acrylate polymer dispersions which give soft sticky films are the most suitable.

Example 2

An aqueous dispersion of unmodified vinyl

acetate/acrylic copolymer comprising 10-30% vinyl acetate content and 70-90% alkyl acrylate content (sold under the Trade Mark WITCOGRIP A 960 by Witco Chemicals Limited). The alkyl acrylate constituent is preferably a blend of two or more alkyl acrylates each with an alkyl group based on a carbon chain having between 4 and 8 carbon atoms per molecule.

The adhesives of Example 1 and Example 2 were, in each case, applied to one face of each of a number of pads or sheets of sound deadening material which were then applied to oily steel surfaces and to painted surfaces under factory conditions. The pads were composed of filled bitumen. The quantity of adhesive applied was sufficient to hold the pads in position but did not produce a satisfactory permanent bond. The adhesive coated pads were then heated to 175°F at which temperature the adhesive fused and bonded the pads to the surfaces. Subsequent tests showed the bond to be well up to the standard attained using conventional pads requiring heating to about 275°F thereby showing a considerable saving in the energy required. The pads also stood up satisfactorily to other normal service conditions.

It will be appreciated that pressure sensitive adhesives other than those described may be used if desired, and various materials other than those described may be bonded to one another. Moreover, while present experiments indicate that satisfactory results will generally be obtained using temperatures below 200°F, it may in some circumstances be advantageous to heat to temperatures above 200°F but below 275°F.

WHAT WE CLAIM IS:—

1. A method of bonding materials together using adhesives comprising temporarily attaching (as hereinbefore defined) the materials by means of a pressure sensitive adhesive and then heating the assembly to an activation temperature (as hereinbefore defined) below 275°F.

2. A method according to claim 1 wherein the pressure sensitive adhesive has an activation temperature (as hereinbefore defined) below 200°F.

3. A method according to claim 1 or 2 wherein the pressure sensitive adhesive comprises an aqueous acrylic polymer dispersion.

4. A method according to claim 3 wherein the pressure sensitive adhesive comprises 60 to 70 per cent poly alkyl acrylate, 15 to 20 per cent of an alkyl acrylate/vinyl acetate copolymer, and 15 to 20 per cent poly vinyl isobutyl ether, all percentages being based on total polymer solids content and has an activation temperature between 170°F and 180°F.

5. A method according to claim 4 wherein the pressure sensitive adhesive comprises 66.6 per cent aqueous poly alkyl acrylate dispersion. 16.8 per cent aqueous alkyl acrylate/vinyl acetate copolymer dispersion, and 16.6 per cent aqueous poly vinyl isobutyl ether dispersion.

6. A method according to claim 4 or 5 wherein the poly alkyl acrylate is poly butyl acrylate.

7. A method according to claim 4 or 5 wherein the poly alkyl acrylate is poly octyl acrylate.

8. A method according to claim 3 wherein the pressure sensitive adhesive is an aqueous dispersion of a vinyl acetate/acrylic copolymer comprising 10 to 30 per cent by weight vinyl acetate content and 70 to 90 per cent by weight alkyl acrylate content.

9. A method according to claim 8 wherein the alkyl acrylate constituent comprises a blend of two or more alkyl acrylates each with an alkyl group based on a carbon chain having between 4 and carbon atoms per molecule.

10. A method of bonding a filled bitumen sound deadening sheet material to a metal surface comprising temporarily attaching (as hereinbefore defined) the material to the metal surface by means of a pressure sensitive adhesive comprising an aqueous acrylic polymer dispersion, and subsequently heating the assembly to an activation temperature (as hereinbefore defined) between 170°F and 200°F.

11. A method of bonding materials together substantially as hereinbefore described.

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